

# Claims

- [c1] A method of forming an injection molded part in a mold cavity comprising:
- initiating injecting plastic material into the mold cavity;
  - introducing a first volume of gas into the plastic material in the mold cavity, said first volume of gas being introduced from a fixed volume reservoir and forming a hollow cavity in the plastic material;
  - continuing to inject plastic material into the mold cavity until the mold cavity is filled;
  - packing the plastic material in the mold cavity; and
  - injecting a second volume of gas into the plastic material.
- [c2] The method as described in claim 1 wherein said second volume of gas is introduced into said hollow cavity.
- [c3] The method as described in claim 1 wherein said first volume of gas has a first quantity of gas material at a first pressure and said second volume of gas has a second quantity of gas material at a second pressure, said first pressure is less than said second pressure.
- [c4] The method as described in claim 3 wherein said first

pressure is insufficient to cause the gas to pass through said plastic material and into said mold cavity.

[c5] The method as described in claim 1 wherein said first volume of gas has a first quantity of gas material at a first pressure and said second volume of gas has a second quantity of gas material at a second pressure, said first pressure being less than said second pressure and said first quantity of gas material being less than said second quantity of gas material.

[c6] The method as described in claim 5 wherein said first pressure is insufficient to cause the gas to pass through said plastic material and into said mold cavity.

[c7] The method as described in claim 1 wherein said introduction of the first volume of gas is initiated based on the temperature of the plastic material in the mold cavity.

[c8] The method as described in claim 1 further comprising the step of determining the temperature of the plastic material in the mold cavity, and wherein said introduction of the first volume of gas is initiated when said temperature reaches a predetermined amount.

[c9] The method as described in claim 8 wherein the temperature of the plastic material is determined by a thermo-

couple positioned adjacent the mold cavity.

- [c10] The method as described in claim 1 further comprising the steps of allowing the plastic material in the mold cavity to cool and at least partially solidify to form a molded plastic product, venting the first and second volumes of gas from the plastic product, and ejecting the plastic product from the mold cavity.
- [c11] The method as described in claim 10 further comprising the step of recharging the fixed volume reservoir with another volume of gas.
- [c12] The method as described in claim 1 wherein said introduction of a first volume of gas into the plastic material comprises determining the temperature of the plastic material in the mold cavity and operating a first valve mechanism to release said first volume of gas from said fixed volume reservoir.
- [c13] The method as described in claim 1 further comprising the step of positioning a temperature sensing device adjacent said mold cavity and utilizing said device to measure the temperature of the plastic material in the mold cavity, and wherein the first volume of gas is not initiated until a predetermined temperature is measured by said device.

- [c14] The method as described in claim 13 further comprising the step of varying the position of the temperature sensing device relative to the mold cavity in order to regulate the initiation of the introduction of the first volume of gas.
- [c15] The method as described in claim 13 wherein said first volume of gas is introduced into said mold cavity by a gas pin member.
- [c16] The method as described in claim 13 wherein said second volume of gas is injected into said mold cavity by said gas pin member.
- [c17] A method of forming an injection molded part in a mold cavity comprising:  
charging a first volume of gas in a fixed volume reservoir;  
introducing a first volume of plastic material into the mold cavity;  
determining the temperature of said plastic material in the mold cavity;  
introducing said first volume of gas into said first volume of plastic material when said temperature of said plastic material reaches a predetermined value, said first volume of gas forming a hollow cavity in said plastic ma-

terial;  
filling said mold cavity with plastic material;  
injecting a second volume of gas into the hollow cavity in  
said plastic material;  
allowing said plastic material to cool;  
venting at least said second volume of gas from said  
plastic material; and  
removing said cooled plastic material from said mold  
cavity.

[c18] The method as described in claim 17 further comprising  
the steps of recharging said first volume of gas in said  
fixed volume reservoir.

[c19] The method as described in claim 17 further comprising  
the step of repeating the molding cycle to form another  
injection molded part.

[c20] A system for forming an injection molded part in a mold,  
said system comprising:  
a mold having a mold cavity in the shape of the part;  
an injection molding machine for injecting plastic mate-  
rial into the mold cavity;  
a gas pin positioned in said mold for injecting gas into  
said mold cavity;  
a sensing device positioned in said mold adjacent said  
mold cavity for detecting the presence of plastic material

injected into said mold cavity;  
a fixed volume reservoir for introducing a first volume of gas into plastic material in the mold cavity;  
a control mechanism for allowing gas from said fixed volume reservoir to pass into the mold cavity upon detection of plastic material in the mold by said sensing device;  
a supply of gas for introducing a second volume of gas into the plastic material in the mold cavity; and  
a gas controller for use in introducing a second volume of gas into the plastic material.